Claims

1. A method of precise first-path detection in CDMA mobile communications systems, the method comprising the steps of:

a. calculating the noise threshold for the first-path detection according to the multi-path profile;

b. judging whether there is a maximum point exceeding the noise threshold in the multi-path profile, if yes, carrying out side-lobe suppression at the maximum point which exceeds the noise threshold and obtaining candidate first path; otherwise, deciding that no first path exists, and exiting the entire process of first-path detection;

c. judging according to the location of the candidate first path whether the first path is ambiguous, if yes, carrying out correction of first-path ambiguity, and outputting the corrected location of final first path; otherwise, outputting the location of candidate first path as the location of final first path.

2. A method according to Claim 1, , in step c, if the first path is not ambiguous, before outputting the location of final first path, the method further comprising:

Step d: carrying out conic interpolation computation for the candidate first path and obtaining the location of final first path according to the result of the interpolation computation.

3. A method according to Claim 1, the said side-lobe suppression in step b comprising:

b1. from the starting location of the multi-path profile to the end of the multi-path profile, searching the location of the first maximum point exceeding the noise threshold of the profile thereof;

b2. finding the location of the largest power value within N chips after the location of the current maximum point;

b3. judging whether the largest power value in step b2 is larger than the power value at the location of the current maximum point by M dB or more, if yes, going to step b4; otherwise going to step b5;

b4. from the next sampling point after the location of the current maximum point, searching in the multi-path profile the location of the first maximum point exceeding the noise threshold and taking this location as the location of the current maximum point, and then returning to step b2;

b5. making the location of the current maximum point as the location of the candidate first path;

where the feasible range of value of N is from 3.5 to 4.0, and the feasible range of value of M is from 12 to 14.

4. A method according to Claim 1, , the said judging in step c whether the first path is ambiguous comprising:

c1. calculating the threshold for first-path ambiguity detection;

c2. from the location of the candidate first path to the starting location, searching the first location where the power is lower than the threshold for first-path ambiguity detection, Then moving to the next sampling point to obtain the first location where the power is higher than the threshold for first-path ambiguity detection;

c3. judging whether the spacing between the candidate first-path location and the first location where the power is higher than the threshold for first-path ambiguity detection is no less than 1.5 chips, if yes, the first path is ambiguous; otherwise, the first path is not ambiguous.

5. A method according to Claim 4, , the procedure of calculating the threshold for first-path ambiguity detection in step c1 comprising:

subtracting the power of the candidate first path by M dB to obtain the first-path threshold, taking the larger value between the first-path threshold and the noise threshold as the threshold for first-path ambiguity decision; where the feasible range of the value of M is from 12 to 14.

6. A method according to Claim 4, , the said correction of first-path ambiguity in step c comprising:

obtaining the said location of final first path by moving NUM1 chips towards the right from the first location where the power is higher than the threshold for first-path ambiguity detection, where the feasible range of the value of NUM1 is from 0.9 to 1.1

7. A method according to Claim 4, , the said correction of first-path ambiguity in step c comprising:

obtaining the said location of final first path by moving NUM2 chips towards the left from the candidate first-path location, where the feasible range of the value of NUM2 is from 0.9 to 1.1.

8. A method according to Claim 4, the said correction of first-path ambiguity in step c comprising:

determining the location of the inflection point in the points sequence composed of sampling points between the candidate first-path location and the first location where the power is higher than the threshold for first-path ambiguity detection and taking this inflection point as the said location of final first path.

9. A method according to Claim 2, , in step d, the said conic interpolation computation is carried out according to the following conic interpolation formula for first-path calibration:

$FP = X1 + (Y0 - Y2) / (2*(Y0-2*Y1+Y2))$ When both Y0 and Y2 exist;

$FP = X1$ When Y0 or Y2 does not exit;

wherein, FP is the calibrated location of final first path, the location of candidate first path location is X1; the location of the sampling point to the left of the candidate first path is X0; the location of the sampling point to the right of the candidate first path is X2; and correspondingly, the power at the candidate first-path location is Y1; the power at the sampling point to the left of the candidate first path is Y0; the power at the sampling point to the right of the candidate first path is Y2.

10. An apparatus of precise first-path detection in CDMA mobile communications systems, the apparatus comprising at least a module for noise threshold calculation, a module for side-lobe suppression, and a module for first-path ambiguity detection and correction, wherein:

the module for noise threshold calculation is for use in receiving the multi-path profile from the matched filtering module, calculating the noise threshold for the first-path detection according to this multi-path profile, and then outputting this noise threshold to the module for side-lobe suppression;

the module for side-lobe suppression is for use in finding the candidate first path and carrying out side-lobe suppression based on the received noise threshold using the

processing method of side-lobe suppression, and then outputting the candidate first path to the module for first-path ambiguity detection and correction; and

the module for first-path ambiguity detection and correction is for use in carrying out first-path ambiguity detection according to the received location of the candidate first path, if there is first-path ambiguity, making first-path ambiguity correction to obtain the corrected location of final first path; if there is no first-path ambiguity, just outputting the location of candidate first path.

11. An apparatus according to Claim 10, , the apparatus further comprising: a module for conic interpolation, which is for use in receiving the candidate first path without first-path ambiguity from the module for first-path ambiguity detection and correction, calculating the location of final first path according to the conic interpolation formula for first-path calibration, and outputting the calibrated location of final first path.